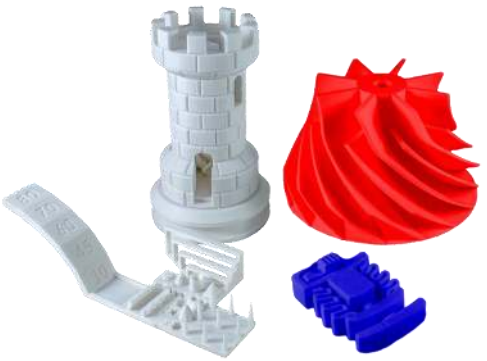
PLA-X³

PLA-X³ is our industrial high-performance PLA which features extreme performance on speed[1], mechanical properties[2] and high heat environments[3]. PLA-X³ is perfect for printing speeds of > 120mm/s, allowing you to be more efficient at the same time. Users who use a lot of ABS now have a bio-based alternative material with all the advantages of ABS and none of the disadvantages like shrinking and delamination. Due to the composition of PLA-X³ the material is already highly crystalline after printing, which increases the stiffness of the material at higher temperatures. When you combine this with annealing the PLA-X³ the material reaches an HDT of 95°C+. Compared to other high temp. resistant PLA types PLA-X³ has the USP of negligible small shrinkage after annealing (the dimensional accuracy is superb). PLA-X³ has been specifically engineered for industrial applications where you want an easy to print filament with high mechanical properties. Objects that are printed with PLA-X³ will have a semi matte finish which not only looks great but helps concealing layer lines.

Material features:

- Prints like PLA, performs like ABS
- Engineered for fast printing (> 120mm/s)
- ABS matching mechanical properties
- Great heat resistance at higher temperatures
- HDT after annealing 95°C+
- Semi matte finish after printing
- Negligible shrinkage after annealing



Colours:

PLA-X3 is available from stock in 6 colours.

bk1 | na1 | rd1 | bu2 | gy1 | gyb

Packaging:

PLA-X3 is available in nearly any type of packaging and labelling. Ask our team to help you customizing your product.

Filament specs.		
Size	**Ø tolerance**	**Roundness**
1,75mm	± 0,05mm	≥ 95%
2,85mm	± 0,10mm	≥ 95%

Material properties		
Description	**Testmethod**	**Typical value**
Specific gravity	ISO 1183	1,27 g/cc
MFI 210°C / 2,16kg	ISO 1133	6 g/10 min*
Tensile strength at break	ISO 527	40 MPa
Elongation strain at break	ISO 527	47%
Tensile (E) modulus	ISO 527	4000 MPa
Impact strength – Charpy notched 23°C	ISO 179	23 kJ/m2
Printing temp.	Internal method	230±10°C based on speed
Melting temp.		205±15°C
Heat Deflection temp. (B) (after annealing)	ISO 75	95°C+**

Additional info:

PLA-X³ can be printed without a heated bed. If you have a heated bed the recommended temperature is ± 50-60˚C.
PLA-X³ adheres to any print surface though we always recommend some adhesive or a print sticker.
PLA-X³ can be used on most common desktop FDM or FFF technology 3D printers. Storage: Cool and dry (15-25˚C) and away from UV light. This enhances the shelf life significantly.

***Viscosity is lower (higher MFI) at a higher printing temperature (240°C ±10°C), which increases the printing speed capabilities.**
****These results are preliminary and are based on several tests made in-house.**
Current values should be considered factual (± 10%). We will update the technical datasheet as testing progresses (or finishes).

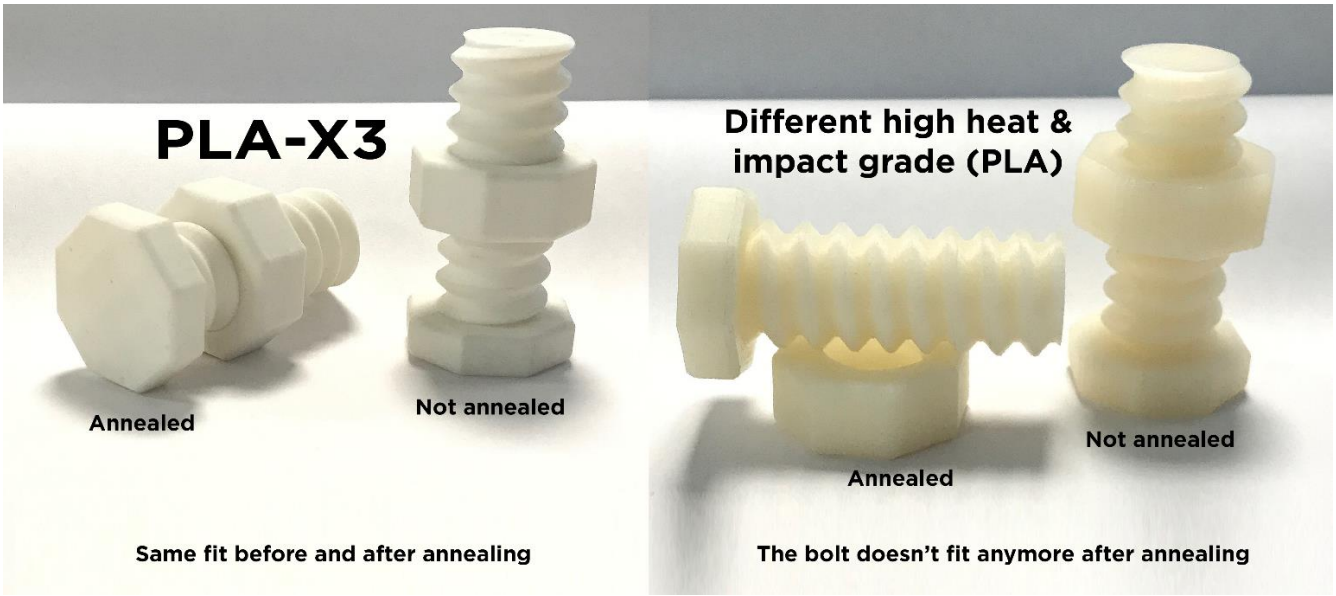
What exactly is annealing:

The annealing of plastics can be defined as a secondary process wherein a plastic object is brought to a certain temperature, kept there for a time, and then cooled to room temperature.

The primary reasons for annealing a plastic object include the reduction or removal or residual stresses and strains, dimensional stabilization, reduction or elimination of defects, and improvement of physical properties.

Plastics are generally bad at conducting heat. This means that when an annealed object is cooled down too quick the annealing process will be disturbed which in turn re-introduces stress in the object. This can lead to deformation, shrinkage and / or other unwanted results.

Potential issues can be prevented by taking care that the annealed object cools down slowly.



How to anneal:

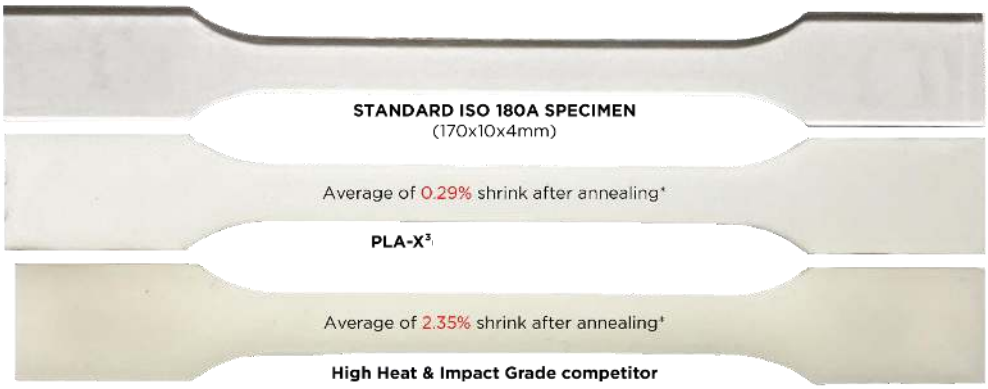
Annealing objects made with PLA-X³ is not difficult but has to be done properly for the best results.
We have done a lot of tests and believe we've found the right settings to achieve success every time.

1. Pre-heat a convection oven at 110°C / 230°F (use a thermometer to calibrate the exact temperature)
2. When the oven is pre-heated, quickly put your printed object (tip; Keep the supports attached) in the oven and start a timer. *We recommend placing the object on a flat aluminum sheet or similar.*
    - For small objects with thin walls & medium infill set a 20-minute timer
    - For large objects with thick walls & medium infill set a 60-minute timer
3. When the object is done annealing, do NOT remove the object, but instead just turn off the oven. Now wait for the oven to cool down to room temperature. Please be patient as this can take a while.
4. Remove the object from the oven (remove the supports) and now you have a perfectly annealed PLA-X³ print.

"A higher infill percentage while printing with PLA-X³ will result in even less shrinkage during annealing."

During the annealing process, the already high crystalline PLA-X³ material will (rapidly) crystalize further.
In practice, this means that PLA-X³ will become extra stiff at high temperatures.
The material has been developed for dimensional accuracy both before and after annealing which explains the low shrinkage that you will experience when working with PLA-X³.

Extra information:



Specimens are printed at 50mm/s, 0.2 layer height, 0.4 nozzle, 100% infill and annealed in a pre-heated oven at 110c for 1 hour. After annealing the oven is allowed to slowly cool completely off for the best crystilization results.

Close up a printed object with PLA-X³
(Printed on an Ultimaker 2+, 0.19 layer height, 242c)

PLA
50mm/s, 0.4 nozzle, 0.2 layers, UM2+
Result after 17 hours

PLA-X³
120mm/s, 0.4 nozzle, 0.2 layer, UM2+
Result after 17 hours

3D printed iPhone 7 cases
(after annealing at 110°C / 20min)

PLA-X³ still fits where the competitor had so much shrinkage that the part has become useless because it simply became too small.